



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Alberto Alvarez-Calderon F. Group Art Unit: 3617  
Serial N<sup>o</sup>: 09/677,583 Examiner: E. Swinehart  
Filed: September 29, 2000 Attorney Docket N<sup>o</sup>: 1186-001  
For: SUBMERSIBLE HULL AND HYDROFIELD

**APPENDIX I FILED WITH AMENDMENT PURSUANT TO 37 C.F.R. § 1.111**

Mail Stop Non-Fee Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action of April 30, 2003, Paper N<sup>o</sup> 5, in the above-entitled application, please review and include the following Appendix:

**NOTE:** This text and figures are from SUPPLEMENTARY AMENDMENT of March 13, 2003 which was not entered by Examiner before his action of April 30, 2003. Applicant appreciates interview granted by Examiner on March 6, 2003. It is summarized below.

1. DVD DEMONSTRATES SUCCESSFUL TRANSONIC HULL MODEL TESTS:

During the interview, applicant showed a DVD of 23-minute length summarizing several years of privately funded research, development, and model tests of Transonic Hulls (TH). The DVD covered four parts:

Part I Tow tank tests of a 6 foot model.

Part II Tests of electric powered remote control TH surface model of 4 feet length. Tests were in a pond, and in beach surf. The tests in surf also showed a model of a conventional patrol boat of the same size and weight, for comparison. The TH model showed more favorable stability and control characteristics in surf with much less disturbances in pitch, surge, yaw, and sway. It also exhibited a stronger upright tendency, and a self righting tendency in the presence of large diagonal and cross seas.

1 Part III Tests of a 6-foot remote control TH surface model powered by an internal  
2 combustion engine. These tests were in a pond, in the bay with chop, and  
3 across the large wake of the manned chase boat.

4 Part IV Tests of a 3-foot remote control TH surface subsurface model showing  
5 surface and subsurface operation in a pond and in beach surf.

6 1.1 Remarks on Part I: Tank tests of a 6 ft. model

7 The stills of tow tank tests in the DVD clearly showed the hydrofield and rays of the first TH  
8 patent, which phenomena were also confirmed in the subsequent tests of the powered TH models.

9 1.2 Remarks on Part II: Tests of a 4 ft. TH powered model in pond and in beach surf

10 Examiner noted the new type of pitch control capability displayed by the electric powered  
11 TH model, namely, Approximately \*15 deg and -10 deg hull angles sustained in time. Applicant  
12 explained this was accomplished by its powerful trailing edge flaps, and was intended also to provide  
13 steady pitch attitude in rough sea by means of gyroscopic sensors with electric output to attain, with  
14 rapid servo control on the flap, a smooth ride. This feature is covered in U.S. Patent Application  
15 09/677 897, for example its Figs. 14D and 14E.

16 1.3 Remarks on Part III: Tests of 6 ft. TH powered model in pond and bay

17 There is enclosed in SHEET 1 (attached), a photo of the 6 ft. TH gas powered model shown  
18 in Part III of the DVD. Examiner properly observed the hydrodynamic regime in which the bow is  
19 raised slightly above the water level, which applicant identified as "transplannar." This is covered  
20 in Figs. 14a and 14b of U. S. Patent Application 09/677 897, and some of its Claims. The term  
21 "transplannar" denotes a regime different from planning, in that the angle of attack of TH's bottom  
22 surface is considerably smaller than that of planning hulls, as a result of TH's maximum beam  
23 located at its stern, and in TH not having lateral outflows typical of conventional planning hulls.

24 1.4 Remarks on Part IV: Surface and subsurface TH model tests in pond and surf

25 This part of the DVD showed surface and subsurface testes of the three feet electric powered  
26 TH model equipped with hydro wings and elevator such as shown in Figs. 3 and 5b of present Patent  
27 Application 677 583. Tests were made in pond and ocean surf. High speed and maneuvering  
28

1 regimes were displayed both on surface and subsurface. Also, Part IV clearly displayed TH's  
2 capability of piercing large steep waves, large broken and breaking waves, and also accepting being  
3 overtaken by steep and broken waves, such as shown in Figs. 8a and 8b of the present patent  
4 application. Examiner remarked on the model's high speed displayed subsurface. Applicant  
5 concurred it was very fast (perhaps because favorable Reynolds number regime and/or transitions  
6 which were not ascertainable in tests). Photos of the hull of the surface/subsurface model without  
7 its wings are shown in attached SHEET 2. SHEET 3 shows proof of the unique and favorable X  
8 regime, which is shown in Patent Application 677 897.

## 10 2. REVIEW OF PHOTOS OF TESTS OF MANNED TH BOATS IN BEACH SURF

11 Photos of two full size manned TH boats (length 13 and 20 ft.) were shown. Tests covered  
12 the following:

- 13 - Neutral point in static heel for computer calibration
- 14 - Natural period of roll with zero forward speed (a motion which includes effect of virtual  
15 mass)
- 16 - Pitch attitudes and pitch stability when encountering large, steep, curled, and broken waves.

17 The photos demonstrated that the intended pitch stability was attained. Photos of these tests  
18 are very important for calibration of dynamics in pitch and heel with computer programs having only  
19 hydrostatic pitch and roll output, as are those of affordable costs.

## 21 3. REVIEW OF PRELIMINARY DESIGNS OF SEVERAL TH BOATS

22 Based on TH's R&D, model tests and manned boat tests with zero forward speed, conducted  
23 under the writer's direction, it has become possible to carry out preliminary designs of TH boats,  
24 several of which were shown in the interview with the aid of three-view drawings. These designs  
25 follow the principal parameters of the patent applications of TH, including shape, relation of weight  
26 to length's cube, power loading (weight to horsepower), and hydrostatic righting moments. Beyond  
27 these conventional parameters, the preliminary designs exploit new criteria for TH boats such as

1 beam loading, water plan area loading, longitudinal volume distribution of the present patent  
2 application, and lower freeboard. The preliminary designs reviewed are:

- 3 - TH-20, a two seater surface sport version derived from manned tests of TH-13
- 4 - TH 31, a three seat full stealth surface-subsurface military design for over-the-horizon  
5 insertion-extraction of special forces, or as a surface-subsurface spot boat for high speed  
6 cruise in rough ocean, or for surfing and penetrating large seas, and for sea rescue
- 7 - TH-60, a powerful fast surface-only luxury yacht

8 These designs were hydrodynamically advanced, and also provided space for occupants,  
9 powerplants, equipment, etc., taking into account riding qualities, entry and exit of occupants, etc.